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*THE GENUS FRAXINUS IN NEW MEXICO AND ARIZONA.*

BY ALFRED REHDER.

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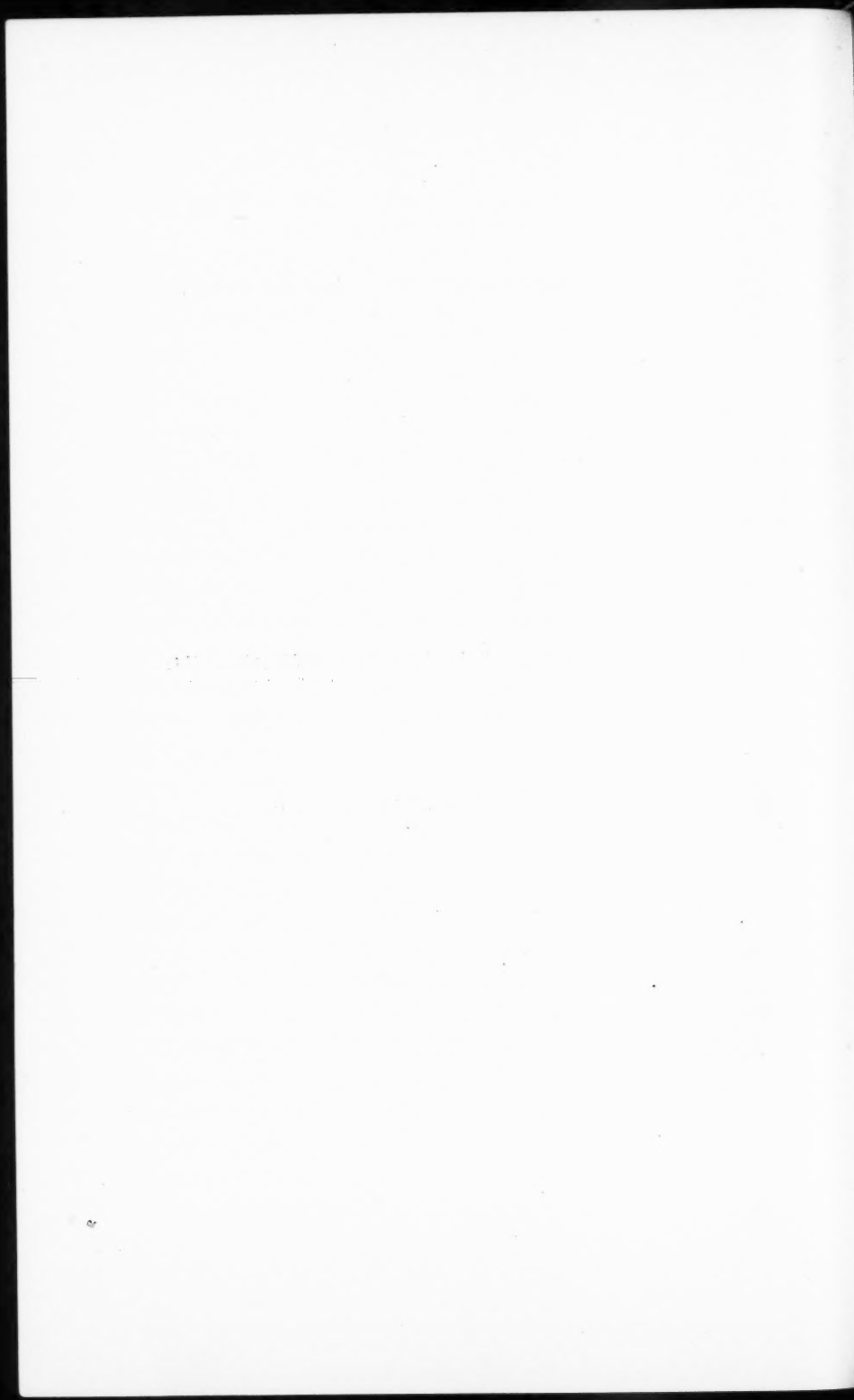
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*THE GENUS FRAXINUS IN NEW MEXICO AND ARIZONA.*

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## THE GENUS FRAXINUS IN NEW MEXICO AND ARIZONA.

BY ALFRED REHDER.

Received April 15, 1917.

WHILE collecting in Arizona and New Mexico for the Arnold Arboretum in the summer of 1914 and 1916 I paid special attention to the various species and forms of *Fraxinus*. There are at present six species of *Fraxinus* known from that region. One of them, *F. Lowellii* Sargent, is endemic to central Arizona; three, *F. velutina* Torrey, *F. Standleyi* Rehder and *F. cuspidata* Torrey, are found through a considerable part of the territory under consideration, while *F. anomala* Torrey occurs only in northern Arizona where it reaches the southeastern limit of its range, and the Mexican *F. papillosa* Lingelsheim just crosses the extreme southern border of New Mexico. Though these six species are easily distinguished from each other, as shown in the following key, they all exhibit a greater or lesser degree of variability like most other American Ashes; particularly *F. velutina* is extremely variable in its tomentum, in the size, shape and texture of its leaflets, in the length of the petiolules and in the shape and size of its fruits. The extreme forms might easily be taken for distinct species, if it were not for the fact that they are closely connected by intermediate forms and do not occupy separate geographical areas. This is particularly true of the glabrous and pubescent forms which I found in almost every instance growing side by side in the same locality.

This study is based on material in the herbarium of the Arnold Arboretum supplemented by a considerable number of specimens for the loan of which I am indebted to those in charge of the National Herbarium and of the Gray Herbarium; I also am under obligation to Dr. N. L. Britton for the permission to examine and photograph some of the types in the herbarium of the New York Botanic Garden. All the species except *F. papillosa* known so far within our area only from a single locality I have had the opportunity to observe and study in the field.

*Key of the species.*

Flowers with petals: branchlets slender, terete: leaves 3-9-foliate.

1. ***F. cuspidata*.**

Flowers without petals.

Body of the fruit nearly terete with the wing almost terminal extending scarcely below the middle: branches terete.

Leaflets 3-7: body of the fruit narrowly cylindrical, gradually narrowed toward the base, 1.5-2 mm. thick, about 5-8 times as long as thick, wing shorter than the body, linear or spatulate, 3-5 mm. broad.

2. ***F. velutina*.**

Leaflets 7-9, rarely 5: body of the fruit ellipsoid to oblong, rather abruptly contracted at the base, 2.5-3.5 mm. thick, about 2-4 times as long as thick, wing usually longer than the body, linear-oblong, 5-7 mm. broad.

Under side of the leaflets green or glaucescent, not papillose.

3. ***F. Standleyi*.**

Under side of the leaflets glaucous, papillose. . . . . 4. ***F. papillosa*.**

Body of fruit much compressed, with the wing extending to the base of the body: branchlets more or less quadrangular.

Leaves pinnate, 3-7-foliate. . . . . 5. ***F. Lowellii*.**

Leaves simple, only occasionally 3-foliate. . . . . 6. ***F. anomala*.**

1. ***Fraxinus cuspidata*** Torrey in *Rep. U. S. & Mex. Bound. Surv.* II. pt. 1 (*Bot.*) 166 (1859).—Gray, *Syn. Fl. N. Am.* II. pt. 1, 74 (1878).—Hemsley, *Bot. Biol. Am. Cent.* II. 304 (1881-82).—Wenzig in *Bot. Jahrb.* IV. 171 (1883).—Havard in *Proc. U. S. Nat. Mus.* VIII. 510 (1885).—Pringle in *Gard. & Forest*, I. 142 (1888).—Sargent in *Gard. & Forest*, II. 447 (1889); *Silva N. Am.* VI. 29 (excl. tab.) 1894; *Man. Trees N. Am.* 759 (excl. fig.) (1905).—Coulter in *Contrib. U. S. Nat. Herb.* II. 259 (1892).—Wesmael in *Bull. Soc. Bot. Belg.* XXXI. 80 (1892).—Britton, *Trees N. Am.* 810, fig. 142 (1908).—Schneider, *Ill. Handb. Laubholz.* II. 820, fig. 514 k-m, 516 d (1912).—Wooton & Standley in *Contrib. U. S. Nat. Herb.* XIX. 496 (*Fl. N. Mex.*) (1915).

*Ornus cuspidata* Nieuwland in *Am. Midland Nat.* III. 187 (1914).

NEW MEXICO. Otero Co.: Sacramento Mts., Fresno Canyon, alt. 1800 m., August 18, 1914 and August 24, 1916, *A. Rehder* (Nos. 333, 422, 425, 425*b* (pubescent form)). Dona Ana Co.: San Andreas Mts., Ash Spring Canyon, May 24, 1913, *E. O. Wooton* (*U. S. Nat. Herb.* No. 661852). Grant Co.: Big Hatchet Mts., May 18, 1892, *E. A. Mearns* (No. 127), alt. 2200 m., July 23, 1908, *E. A. Goldman* (No. 1337). Valencia Co.: McCarthy's Station, July 25, 1889,

*Munson & Hopkins*; near Grant, June 6, 1904, *A. Chaves* (U. S. Nat. Herb. Nos. 560670, 738264). *McKinley Co.*: Fort Wingate, 1881, *W. Mathews* (No. 19); Gallup, June 14, 1916, *Alice Eastwood* (Nos. 5637, 5638). Without precise locality, 1851-52, *C. Wright* (No. 1698, in part); 1869, *E. Palmer* (No. 71).

WESTERN TEXAS. Eagle Springs, June 21, 1855, and mouth of the Great Canyon of the Rio Grande, *C. C. Parry & J. M. Bigelow* (type specimen); Chisos Mts., August 1883, *V. Havard* (No. 69).

MEXICO. *Chihuahua*: Santa Eulalia Mts., April 6 and June 6, 1885, *C. G. Pringle* (No. 137).

This species I have seen only as a tall shrub from 3-5 m. high branching from the base into slender upright stems; it is usually found on rocky slopes at an elevation of from 1600-2200 m. It is distributed from the provinces of Coahuila and Chihuahua of Mexico through western Texas and the southwestern half of New Mexico to northern Arizona; it does not seem to occur in northeastern New Mexico or in southwestern Arizona. It shows some variation in the serration and in the number of leaflets and the following varieties may be distinguished from the typical form which has 5-7, rarely 3, lanceolate to ovate-lanceolate leaflets occasionally sparingly serrate. Shrubs with rather densely pubescent and at the same time smaller and broader leaflets apparently represent merely a juvenile form, as I found such foliage only on stunted shrubs without fruit; only once I found a slightly pubescent shrub with a few fruits. Pringle has also distributed sterile branches with pubescent leaves under his number 137 from the Santa Eulalia Mountains in Chihuahua.

***Fraxinus cuspidata* var. *macropetala*, n. var.**

*Fraxinus macropetala* Eastwood in *Bull. Torr. Bot. Club*, XXX. 494 (1903).—Lingelsheim in *Bot. Jahrb.* XL. 216 (*Vorarb. Monog. Fraxinus*, 36) (1907).

ARIZONA. *Coconino Co.*: Grand Canyon, July 9, 1892, *E. O. Wooton* (U. S. Nat. Herb. No. 738265), July 13, 1892, *J. W. Toumey* (No. 273), June 1905, *C. A. Purpus*, June 13, 1913, *A. E. Hitchcock* (Nos. 76, 78); Red Canyon Trail, June 10, 1901, *L. F. Ward* (U. S. Nat. Herb. No. 410119); Bright Angel Trail, alt. 1400-2200 m., 1909, *E. W. Nelson* (No. 108), May 31 and August 19, 1913, *E. A. Goldman* (Nos. 2067, 2223), alt. 1400-2000 m., July 19, 1914, *A. Rehder* (No. 106); Hermit Trail, June 18, 1916, *Alice Eastwood* (No. 5822); Grand View Trail, June 16, 1916, *Alice Eastwood* (No. 5693). Sycamore Canyon, southwest of Flagstaff, Oct. 4, 1915, *Percival Lowell*, alt. 1350 m., Sept. 14, 1916, *A. Rehder* (No. 578).

This variety differs from the type chiefly in its 3-5-, rarely 7-foliate leaves with broader, often ovate, entire leaflets; occasionally with simple leaves at the base of the branchlets. All the other distinguishing characters given in the original description of *F. macropetala* can be found in the typical form. In the type the divisions of the calyx are also attenuate and very unequal and the longer divisions equal or exceed the tube in length; the length of the corolla varies between 10 and 16 mm.; the shape of the fruit is very variable even in the same locality, and I have before me specimens from the Grand Canyon with fruits having a narrow wing, about 5 mm. wide, 2.8 mm. long and rounded at the apex and others with the wing of the fruit 7 mm. broad and only 2-2.5 mm. long and truncate and emarginate at the apex. On many flowering branchlets all the leaves are simple, as in Ward's specimen from the Red Canyon Trail; a sterile specimen collected by Percival Lowell in the Sycamore Canyon has most of the leaves simple and the others with only one pair of small leaflets at the base.

***Fraxinus cuspidata*, var. *serrata*, n. var.**

*Fraxinus cuspidata* Sargent, *Silva N. Am.* VI. t. 260 (pro parte) (1894); *Man. Trees N. Am.* fig. 605 (pro parte) (1905) tantum quoad plantam depictam.

A typo recedit foliolis manifeste serratis ovatis v. ovato-lanceolatis, plerumque 7, rarius 9 v. 5, paribus inferioribus interdum 3-foliolatis.

MEXICO. Coahuila: mountains east of Saltillo, April 15-20, 1880, *E. Palmer* (No. 796, type); San Lorenzo Canyon, 6 miles southeast of Saltillo, April 16, 1905, *E. Palmer* (No. 536); Sierra Madre, south of Saltillo, April 12, 1906, *C. G. Pringle* (No. 13742); Saltillo, cult. at Cotton mill, April 5, 1887, *C. S. Sargent*.

This variety seems to be restricted to Mexico and is connected with the typical *F. cuspidata* by intermediate forms; such are A. Chaves' specimen from Valencia Co., New Mexico, V. Havard's No. 69 from western Texas and Pringle's No. 137 from Mexico, all enumerated above under the typical *F. cuspidata*.

2. ***Fraxinus velutina* Torrey in Emory, *Not. Reconnoiss. Leavenworth to San Diego*, 149 (1848).<sup>1</sup>—Sudworth, *Rep. Sec. Agric.* 1892,**

<sup>1</sup> Not *F. velutina* Lingelsheim in *Bot. Jahrb.* XL. 216 (*Vorarb. Monog. Fraxinus*, 36) (1907) from Yunnan which belongs to the section *Ornus* and is related to *F. chinensis* Roxburgh; it is based on Henry's No. 11893. I propose for this species the name ***F. Lingelsheimii***, n. nom. (*F. velutina* Lingelsheim, non Torrey).

326.—Sargent, *Silva N. Am.* VI. 41, (excl. tab.) (1894); *Man. Trees N. Am.* 774, (excl. fig.) (1905).—Britton, *Trees N. Am.* 799 (excl. fig.) (1908).—Elwes & Henry, *Trees Gr. Brit. & Irel.* IV. 912, t. 265, fig. 20 (1909).—Wooton & Standley in *Contrib. U. S. Nat. Herb.* XIX. 496 (*Fl. N. Mex.*) (1915).

*Fraxinus pistaciifolia* Torrey in *Pacific R. R. Rep.* IV. 128 (1856); in *Rep. U. S. & Mex. Bound. Surv.* II. pt. 1 (Bot.), 166 (1859).—Hemsley, *Bot. Biol. Am. Centr.* II. 305 (1881–82).—Rusby in *Bull. Torr. Bot. Club*, IX. 54 (1882).—Gray, *Syn. Fl. N. Am.* II. pt. 1, 74 (1878).—Rothrock in *Rep. U. S. Geog. Surv. west 100th Merid.* VI. 186 (1878).—Watson in *Proc. Am. Acad.* XVIII. 113 (1883).—Sargent, *Forest Trees N. Am. 10th Census U. S.* IX. 106 (1884).—Lingelsheim in *Bot. Jahrb.* XL. 221 (*Vorarb. Monog. Fraxinus*, 41) (1907).

*Fraxinus viridis* S. Watson in *U. S. Geol. Explor.* 40th Parall. 284 (non Michaux) (1871).

*Fraxinus americana* var. *pistaciifolia* Wenzig in *Bot. Jahrb.* IV. 182 (1883).—Wesmael in *Bull. Soc. Bot. Belg.* XXXI. 108 (1892).

NEW MEXICO: Lincoln Co.: White Mts., alt. 2500 m., August 25, 1907, Wooton & Standley (No. 3623). Otero Co.: Sacramento Mts., Fresnal Canyon, alt. 2000 m., August 24, 1916, A. Rehder (Nos. 409c, 418); Three Rivers, alt. 1600 m., F. G. Plummer (U. S. Nat. Herb. Nos. 564674, 564675). Dona Ana Co.: Organ Mts., alt. 2300 m., Sept. 20, 1900, Wooton & Standley (U. S. Nat. Herb. No. 499883), alt. 1300 m., September 1, 1897, E. O. Wooton (No. 432). Sierra Co.: between the waters of the Del Norte and the Gila, Oct. 15, 1847, W. E. Emory (type, in herb. N. Y. Bot. Gard.); Head & Wilson Ranch, July 13, 1900, E. O. Wooton (U. S. Nat. Herb. Nos. 738260, 738266); Black Range, Berendo Creek, alt. 1850 m., O. B. Metcalfe (No. 927); Tierra Blanca, 1904, Mrs. I. N. Beals. Socorro Co.: near Glenwood, August 14, 1914, A. Rehder, (No. 290). Grant Co.: Emory Spring, June 4, 1892, E. A. Mearns (No. 284); Dog Mts. June 4, 1892, E. A. Mearns (No. 285); Animas Mts., Indian Canyon, alt. 2000 m., August 7, 1908, E. A. Goldman (No. 1396); San Luis Mts., July 26, 1892, E. A. Mearns (No. 570).

ARIZONA. Navajo Co.: Tusayan, National Forest, June 12, 1912, A. D. Read (U. S. Nat. Herb. No. 583287). Graham Co.: San Carlos Indian Reserv., June 25, 1904, F. V. Coville (No. 1944). Cochise Co.: Huachuca Mts., Sept., 1882, J. G. Lemmon (No.

256); Bowie, September 16, 1884, *M. E. Jones* (No. 4235). Pima Co.: near Tucson, April 1908, *J. N. Rose* (No. 12131), March and October, 1895, *J. W. Toumey* (U. S. Nat. Herb. No. 619020). Yavapai Co.: Sierra Prieta, near Prescott, alt. 1850 m., Sept. 4, 1916, *A. Rehder* (No. 512<sup>b</sup>).

This Ash is widely distributed through New Mexico and Arizona except in the northeastern part of the former of these states, and is rather common along water courses at elevations of between 1000 to 2400 m. It is extremely variable and the most extreme forms have the appearance of distinct species, but they are all closely connected by intermediate forms so that it seems impossible to divide this group of forms satisfactorily into several species, but by selecting the most distinct forms as types the forms may be grouped under the following varieties.

To typical *F. velutina* I refer the specimens enumerated above; they resemble the type specimen in having few, usually 3-5, generally elliptic, short-stalked or nearly sessile leaflets and densely pubescent branchlets and leaves. In the type specimen most of the leaves are 3-foliate; the leaflets of the 3-foliate leaves are elliptic, acute at the ends, distinctly serrate, the larger terminal leaflets measure 5-5.5 cm. by 3-3.5 cm., while the lateral leaflets are similar, but smaller; the lateral leaflets of the 5-foliate leaves are narrower and measure about 4 cm. by 1.5 cm. The fruits are about 2.3 cm. long, with a slender terete body slightly longer than the linear-oblong wing which is 3-4 mm. broad. Typical *F. velutina* is the most common form of this group in southern and western New Mexico and is also found in eastern and central Arizona.

***Fraxinus velutina* var. *Toumeyii*, n. var.**

*Fraxinus velutina* Sargent, *Silva N. Am.* VI. t. 267 (pro parte (1894), tantum quoad plantam depictam.

*Fraxinus attenuata* Jones, *Contrib. West. Bot.* XII. 59 (pro parte) (1908, March 26), quoad specimen ex Arizona.—Wootton & Standley in *Contrib. U. S. Nat. Herb.* XIX. 496 (*Fl. N. Mex.*) (1915).

*Fraxinus Toumeyii* Britton, *Trees N. Am.* 803, fig. 732 (1908).

NEW MEXICO. Guadalupe Co.: Guadalupe Canyon, July 28, 1892, *E. A. Mearns* (No. 582). Dona Ana Co.: Organ Mts., 1881, *G. R. Vasey* (U. S. Nat. Herb. No. 49369); Filmore Canyon, August 4, 1895, and April 15, 1899, *E. O. Wootton* (U. S. Nat. Herb. Nos. 735196, 738263). Sierra Co.: Lake Valley, 1916,



*Mrs. W. G. Beals* (U. S. Nat. Herb. No. 424691). Socorro Co.: Dry Creek, alt. 1600 m., October 13, 1908, *E. A. Goldman* (No. 1571); Glenwood, August 14, *A. Rehder* (No. 292). Grant Co.: Pine Cienaga, July 17, 1900, *E. O. Wooton* (U. S. Nat. Herb. No. 738262); Redrock, September 28, 1908, *E. A. Goldman* (No. 1545); Crawford's Ranch, June 21, 1906, *E. O. Wooton* (U. S. Nat. Herb. No. 738261); Santa Rita, 1877, *E. L. Greene* (No. 36); Bear Mts., April, 1880, *H. H. Rusby* (No. 254); Animas Valley, July 17 and 27, 1892, *E. A. Mearns* (Nos. 500, 576); Alamo Veijo, May 27, 1892, *E. A. Mearns* (No. 176).

ARIZONA. Graham Co.: Fort Grant, June 17, 1912, *L. N. Godding* (No. 1063); Graham Mts., July 26, 1914, *E. A. Goldman* (No. 2337); Black River Lower Crossing, July 27, 1910, *L. N. Godding* (No. 686). Cochise Co.: Chiricahua Mts., Whitetail Canyon, alt. 1650 m., August 17, 1906, *J. C. Blumer* (No. 1250); Five Mile Creek, alt. 1650 m., August 12, 1906, *J. C. Blumer* (No. 1238); Fort Huachuca, 1894, *T. E. Wilcox* (Nos. 46, 202); Barbacomari Creek, alt. 1800 m., October 19, 1893, *E. A. Mearns* (No. 2617). Pima Co.: Tucson, March and October, 1895, *J. W. Toumey* (type of *F. Toumeyi*), July 2, 1891 and August 3, 1892 (No. 274), *J. W. Toumey*, 1891, *G. C. Neally* (No. 62), April 14, 1908, *J. N. Rose* (No. 11758); banks of Rillita Creek, June 17, 1881, *C. G. Pringle*, August 7, 1914, *A. Rehder* (No. 239); Santa Catalina Mts., Sabino Canyon, alt. 950 m., June 15, 1883, *J. J. Thornber* (No. 343), alt. 1800 m., September 1, 1916, *A. Rehder* (No. 499); mouth of Bear Canyon, alt. 1000 m., August 31, 1916, *A. Rehder* (No. 454); Santa Rita Mts., alt. 1400-2000 m., September 1880, *Engelmann & Sargent*. Gila Co.: Tonto Basin, July 19, 1892, *J. W. Toumey* (No. 274). Yavapai Co.: Sierra Prieta, near Prescott, alt. 1800 m., Sept. 4, 1916, *A. Rehder* (No. 512, 512c). "Ash Creek," July 1874, *J. T. Rothrock*. (No. 302).

MEXICO. Sonora: Guadalupe Canyon, August 28, 1893, *E. C. Merton* (No. 2072), Los Pintos, 2000 m., October 11, 1890, *C. V. Hartmann* (No. 127); without precise locality, June 1851, *G. Thurber* (No. 322).

This variety differs from the type chiefly in its 5-7, narrower, slender-stalked leaflets and in the less dense pubescence of its leaves and its branchlets. In the type specimens most of the leaves of the fruiting branch have 7 leaflets which are ovate-lanceolate or elliptic-lanceolate to lanceolate in shape and measure 3.5-5.5 in length and 1.2-1.6 in width, the leaflets of the middle pair being the largest, while

the terminal leaflet equals those of the upper pair. The pubescence of the branches and the leaves is very short and rather thin; the fruits are 2-2.2 cm. long with a linear-oblong wing 3-4 mm. broad. The specimens I have referred to this variety show great variation in pubescence, in the shape and size of the leaflets, in the length of the petiolule and also in the fruits; many specimens are intermediate between the type and this variety and sometimes the leaves of weaker branchlets and those at the base of the vigorous shoots resemble those of typical *F. velutina*, while the upper leaves of vigorous shoots are those of var. *Toumeyi*. The fruits vary from 1.5-3.5 cm. in length with the wing usually narrowly oblong and from 3 to 4 mm. broad, sometimes the wing is spatulate and up to 5 mm. broad, of this the most extreme form is my No. 512 which has the spatulate wing 5 mm. broad and the whole fruit only 1.5-2 cm. long with the body of the fruit 0.8-1.2 cm. long.

This variety is the most common form in Arizona, while in New Mexico the type seems to be more widely distributed.

I have not taken up the name *attenuata* for this variety, though it is the oldest, because the two specimens cited by Jones under his *F. attenuata*, belong to different species or at least different forms, and none of them being designated as the type and the description apparently based on both, it remains uncertain which ought to be considered the type.

***Fraxinus velutina* var. *coriacea*, n. comb.**

*Fraxinus coriacea* S. Watson in *Am. Nat.* VII. 302 (in part) (1873), exclud. planta coll. a Bigelow.<sup>2</sup>—Rothrock in *Rep. U. S. Geog. Surv. west 100th merid.* VI. 185, t. 22 (1878).—Coville in *Contrib. U. S. Nat. Herb* IV. 148 (*Bot. Death Valley Exped.*) (1892).

*Fraxinus pistaciifolia* var. *coriacea* Gray, *Syn. Fl. N. Am.* II. pt. 1, 74 (1878).

*Fraxinus americana* var. *coriacea* Wenzig in *Bot. Jahrb.* IV. 182 (1883).—Wesmael in *Bull. Soc. Bot. Belg.* XXXI. 108 (1892).

NEVADA. "Ash Meadows," 1871, *G. M. Wheeler* (type).

UTAH. St. George, 1875, *E. Palmer*, 1898, *J. W. Carpenter*.

CALIFORNIA. Inyo Co.: Owens Lake near Olancho, June 5, 1906, *Hall & Chandler* (No. 7328, and probably No. 7322).

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<sup>2</sup> Bigelow's specimen from Devil's Run Canyon, western Texas, is *F. texensis* Sargent.

This variety differs from the type in the more coriaceous, slender-stalked and often more coarsely serrate leaflets and in the less densely pubescent or glabrescent branchlets and leaves. In the type specimen the leaflets are generally elliptic, 4.5–5.5 cm. long and 2.5–3 cm. broad, broadly cuneate at the base and abruptly and obtusely pointed, indistinctly serrulate, slightly and sparingly villose on both surfaces, pale yellowish green above and paler and reticulate beneath; a few leaves have obovate leaflets, truncate at the apex and rather coarsely dentate; the fruits are spatulate, 1.8–2.5 cm. long and 5–6 mm. broad below the emarginate apex. Hall & Chandler's No. 7328 is nearest to the type in shape and size of the leaflets, but it is nearly glabrous.<sup>3</sup>

This variety does not seem to occur in Arizona, but some specimens referred to var. *Toumeyi*, as Jones's No. 4235 and Toumey's No. 274, have rather coriaceous leaflets and may be considered transitions to var. *coriacea*.

***Fraxinus velutina* var. *glabra*, n. var.**

*Fraxinus glabra* Thornber in U. S. Herb.

A typo et a varietatibus praecedentibus differt foliis ramulisque glabris et a var. *coriacea* foliolis tenuioribus subtus vix reticulatis.

NEW MEXICO. *Chaves Co.*: near Roswell, alt. 1100 m., August 11, 1916, *A. Rehder* (No. 348). *Dona Ana Co.*: Ash Spring, San Andreas Mts., May 24, 1913, *E. O. Wooton* (U. S. Nat. Herb. No. 661851). *Otero Co.*: Sacramento, Clouderoft, alt. 2800 m., August 20, and alt. 2500 m., August 25, 1916, *A. Rehder* (Nos. 384, 441); *Fresnal Canyon*, alt. 2000 m., August 24, 1916, *A. Rehder* (Nos. 409, 409b).

ARIZONA. *Graham Co.*: San Carlos Indian Reserv., June 25, 1904, *F. V. Coville* (No. 1945). *Cochise Co.*: Huachuca Mts., Tanner Canyon, August 24, 1910, *L. N. Godding* (No. 817); Miller's

<sup>3</sup> Some Californian specimens distributed as *F. coriacea* do not belong here; they represent a glabrous or glabrescent variety of *F. oregona* Nuttall which is apparently identical with *F. oregona* var. *glabra* Lingelsheim in *Bot. Jahrb.* XL. 220 (*Vorarb. Monog. Fraxinus*, 40) (nomen nudum) (1907). To this variety I refer the following numbers which differ from the type in the glabrous or nearly glabrous branchlets and leaves. *Kern Co.*: Greenhorn Mts., alt. 1000–1200 m., 1897, *C. A. Purpus* (No. 5555). *San Bernardino Co.*: Lyth Creek Canyon, July 15, 1902, *Le Roy Abrams* (No. 2741); Cleghorn Canyon, July 6, 1908, *Le Roy Abrams & E. A. McGregor* (No. 703). *Los Angeles Co.*: Liebre Mts., June 20–23, 1908, *Le Roy Abrams & E. A. McGregor* (No. 400).

Canyon, June 19, 1909, *L. N. Godding* (No. 105). Pima Co.: Range Reserve, July 21, 1911, *E. H. Wooton* (U. S. Nat. Herb. No. 690667, type); banks of Rillita, 1881, *C. G. Pringle*. Yavapai Co.: Beaver Canyon, near Camp Verde, alt. 1500 m., Sept. 7, 1916, *A. Rehder* (No. 541); Sierra Prieta near Prescott, 1800 m., September 4, 1916, *A. Rehder* (No. 513).

This variety differs in the quite glabrous branchlets and leaves from the type and from var. *Toumeyi* to which it is nearest in the shape of its leaflets; from specimens of var. *coriacea* with narrower glabrescent leaflets it can be distinguished only by the thinner leaflets not strongly reticulate beneath. It seems to be not uncommon throughout New Mexico and Arizona and in the localities where I collected it I nearly always found it associated with pubescent forms.

### 3. *Fraxinus Standleyi*, n. sp.

Arbor, ramulis hornotinis teretibus glabris v. fere glabris, annotinis cinerascentibus, interdum atropurpureis, vetustioribus cinereis; gemmae ferrugineo-tomentulosae. Folia longe petiolata, 13-18 cm. longa, 7-9-foliolata; foliola sessilia v. brevissime petiolulata, ovata v. ovato-oblonga, rarius elliptica, acuta v. breviter acuminata, basi late cuneata, terminale sensim in petiolulum circ. 0.5 cm. longum attenuatum, omnia irregulariter et leviter serrulata, supra luteo-viridia, glabra, subtus glaucescentia, leviter reticulata, secus costam basin versus plus minusve villosa, cetera glabra v. fere glabra, rarius tota facie sparse minute villosula, minute punctulata, 4-6 cm. longa et 1.5-3 cm. lata in specimine typico, nervis utrinsecus 5-7 ante marginem dissolutis; petioli satis graciles, 2.5-5 cm. longi, interdum purpurascens, supra applanati v. leviter concavi, basi leviter tantum dilatati, glabri; rhachis glabra, supra leviter canaliculata, leviter marginata. Flores non visi. Paniculae fructiferae 8-12 cm. longae, glabrae; pedicelli graciles; calyx persistens minutus, irregulariter inciso-dentatus et denticulatus; samara 2.5-3 cm. longa, capsula subteres v. leviter compressa, ellipsoidea v. oblonga, basi subito contracta, 1-1.3 cm. longa et 2.5-3.5 mm. diam., leviter striata; ala oblongo-spatulata, ad medium capsulae decurrens, 6-7 mm. lata, apice obtusiuscula v. leviter emarginata in specimine typica, interdum anguste oblonga.

NEW MEXICO. Dona Ana Co.: Organ Mts., Van Patten Camp, June 9, 1906, *P. C. Standley* (U. S. Nat. Herb. No. 560835, type). Lincoln Co. White Mts., Gilmore's Ranch, alt. 2500 m., August 17, 1908, *E. O. Wooton* (No. 3943). Luna Co.: Florida Mts.,

alt. 1900 m., September 8, 1908, *E. A. Goldman* (No. 1482). Grant Co.: San Luis Mts., June 25 and October 2, 1892, *E. A. Mearns* (No. 382); Santa Rita, "Copper Mines, N. E. of El Paso", 1851, *J. M. Bigelow*. Without precise locality, 1851, *C. Wright* (No. 1697).

ARIZONA. Graham Co.: White Mts., August 6-15, 1903, *D. Griffith* (No. 5390). Cochise Co.: Huachuca Mts., Ash Canyon August 6, 1909, *L. N. Godding* (No. 342); April, 1897, *J. W. Toumey*. Pima Co.: Santa Rita Mts., September 20-October 4, 1902, *D. Griffith & J. J. Thornber* (No. 176). Coconino Co.: Oak Creek Canyon, alt. 2000 m. and 1800 m., September 15, 1916, *A. Rehder* (Nos. 581, 586); shaded ravine near head of Oak Creek, June 21, 1916, *F. Shreve* (No. 24); San Francisco Mts., Elden Mt., July 17, 1891, *D. T. McDougal* (No. 396).

MEXICO. Sonora: San José Mts., alt. 2400' m., August 7, 1903, *E. A. Mearns* (Nos. 1668, 1671).

This species seems most closely related to *F. velutina* Torrey, but differs chiefly in the usually 7-9-foliate leaves and in the fruit which has a thick, terete, ellipsoid or oblong body, similar to that of *F. americana* Linnaeus and a wing longer than the body; the body is about 2 to 4 times longer than thick and finely striate, while in typical *F. velutina* the fruit has a thin slender body gradually narrowed toward the base, 5-7 times longer than broad and more or less irregularly grooved. The fruit of the latter resembles that of *F. pennsylvanica* Marshall except that it is smaller and has a relatively much shorter wing. From *F. americana* which it resembles in the fruit *F. Standleyi* is distinguished by the sessile smaller leaflets with the epidermis of the under side not papillose and by the smaller fruit.

This new species seems to be as variable as *F. velutina* and of the specimens quoted above no two are exactly alike. Wright's No. 1697 differs in the quite glabrous leaflets more glaucescent beneath and in the narrower, deeply emarginate wing of the fruit. Goldman's No. 1482 has also quite glabrous leaflets, but much smaller and never as many as nine. Griffith's & Thornber's No. 176 has narrower, more glaucescent leaflets and fruits with narrower pointed wings. Mearns's No. 382 has smaller leaflets sparingly short-pubescent on the whole under surface, a puberulous rachis and fruits with narrower wings. McDougal's No. 396 has leaves with always 7, elliptic, distinctly petioluled leaflets and fruits with narrower wings. Godding's No. 343 has also elliptic leaflets always 7 in number and narrower fruits only 1.5-2 cm. long. Shreve's No. 24 and my own No. 581 have 7, rather large, short-stalked, elliptic or oval obtusish

leaflets and quite glabrous and somewhat narrower fruits. My No. 586 has 7 quite glabrous oblong-lanceolate leaflets to 7 cm. long and pointed fruits to 3.5 cm. in length. Wootton's No. 3943 is similar but smaller and Mearn's No. 1671 has also 7 oblong-lanceolate leaflets and somewhat narrower emarginate fruits.

This species is distributed from southwestern New Mexico to southern and central Arizona and extends into northern Mexico.

***Fraxinus Standleyi*, var. *lasia*, n. var.**

A typo recedit foliolis fere semper 7 subtus, ut petioli ramulique, dense velutinis. Foliola in specimine typico ovato-lanceolata, 4.5-8 cm. longa et 1.5-2.8 cm. lata; samara 3-3.5 cm. longa; capsula 1.2-1.5 cm. longa; ala anguste oblonga, circiter 6 mm. lata, emarginata.

ARIZONA. Coconino Co.: Oak Creek Canyon, alt. 1800 m., September 15, 1916, *A. Rehder* (No. 585, type), July 14, 1914, *A. Rehder* (Nos. 41, 42, 43, 44); Sycamore Canyon, southwest of Flagstaff, alt. 1700 m., September 14, 1916, *A. Rehder* (No. 576). Navajo Co.: Fort Apache, June 21-30, *E. Palmer* (No. 592). Graham Co.: White Mts., August 6-15, 1903, *D. Griffith* (No. 5390). Cochise Co.: Pine Canyon, Chiricahua Mts., Oct. 4, 1906, *J. C. Blumer* (No. 1302); Chiricahua Mts., April, 1897, *J. W. Toumey*. Pima Co.: Santa Rita Mts., alt. 2000 m., July 15, 1903, *J. J. Thornber* (No. 299).

NEW MEXICO. Grant Co.: Santa Rita del Cobre, 1877, *E. L. Greene* (No. 37).

This variety differs from the type chiefly in the tomentose branchlets and leaves; it shows considerable variation in size and shape of its leaflets and fruits. Thornber's No. 299 differs in its oblong-elliptic, nearly sessile leaflets. Greene's No. 37 has broader, elliptic to ovate-oblong leaflets. Palmer's No. 592 has similar leaflets, but narrower fruits from 1.5-3 cm. long. Blumer's No. 1302 has 5-7, rather broad, ovate to elliptic leaflets and is much less densely pubescent than the type. Also Griffith's No. 5390 is less pubescent and has 5-7 narrower, rather sharply serrate leaves.

4. ***Fraxinus papillosa*** Lingelsheim in *Bot. Jahrb.* XL. 219 (*Vorarb. Monog. Fraxinus*, 39) (1907).

NEW MEXICO. Grant Co.: west side of San Luis Mts., alt. 1950 m., October 2, 1893, *E. A. Mearns* (No. 2533).

MEXICO. Chihuahua: Sierra Madre, near Colonia Garcia,

September 29, 1899, *Townsend & Barber* (No. 354, type); road from San Mateo to Guasarachi, September 24, 1898, *E. A. Goldman* (No. 153).

This species differs from the preceding species chiefly in the glaucous papillose under surface of the leaflets and from *F. americana* in its sessile smaller leaflets. Mearns's No. 2533 differs from the type in its larger, nearly entire leaflets 4-6 cm. long and 2-2.5 cm. broad and in the larger, many-fruited panicles.

5. ***Fraxinus Lowellii*** Sargent, n. sp.

Folia 9-15 cm. longa, petiolis crassiusculis glabris v. leviter villosis; foliola 5 v. rarius 3, ovata, acuminata, apice acuta v. rarius obtusa, basi cuneata, grosse serrata saepe tantum supra medium, luteo-viridia, supra glabra v. in costa puberula, subtus glabra v. rarius ad basin costae pallide luteae sparse villosula, 6-8 cm. longa et 2.5-3.5 cm. lata, nervis tenuibus arcuatis ante marginem leviter incrassatum et revolutum anastomosantibus; petioluli 5-15 mm. longi. Flores non visi. Fructus mense Julio maturantes, in paniculis longis glabris, oblongi-elliptici v. oblongo-obovati, basi calyce minuto leviter dentato instructi, apice dilatati v. sensim attenuati et rotundati, saepe emarginati, 2.5-3.5 longi et 7-9 mm. lati; ala ad basin capsulae valde compressae striatae 1.8-2.5 cm. longae decurrens.

Arbor 7-8-metralis, cortice fusco profunde fisso, ramulis validis quadrangulatis saepe alatis, interdum fere teretibus, hornotinis fusco-aurantiacis, annotinis cinereo-brunneis.

ARIZONA. Coconino Co.: Oak Creek Canyon, about 20 miles south of Flagstaff, *Percival Lowell*, June 1, 1911, *A. Rehder*, July 13, 1914 (No. 53, type). Yavapai Co.: Copper Canyon, near Camp Verde, alt. 1500 m., *A. Rehder*, September 16, 1916 (Nos. 524, 526, and 529, a pubescent form). Mohave Co.: Peach Springs, 1884, *J. G. Lemmon* (No. 3242).

I take much pleasure in associating with this plant the name of the late Percival Lowell, the distinguished astronomer who has greatly added to our knowledge of the trees of northern Arizona.

C. S. SARGENT.

6. ***Fraxinus anomala*** Torrey in herb. apud S. Watson in *Rep. U. S. Geol. Explor. 40th Parall.* V. 283 (1871).—Parry in *Am. Nat.* IX. 203 (1875).—Gray, *Syn. Fl. N. Am.* II. pt. 1, 74 (1878).—Sargent, *Forest Trees N. Am. 10th Census U. S.* IX. 106 (1884); *Silva N. Am.*

VI. 39, t. 266<sup>4</sup> (1894) *Man. Trees N. Am.* 765, fig. 611<sup>4</sup> (1905).—Wenzig in *Bot. Jahrb.* IV. 186 (1883).—Wesmael in *Bull. Soc. Bot. Belg.* XXXI. 114 (1892).—Koehne, *Deutsche Dendr.* 511, fig. 90 p (1893).—Coville in *Contrib. U. S. Nat. Herb.* IV. 148 (*Bot. Death Valley Exp.*) (1892).—Britton, *N. Am. Trees*, 796, fig. 797 (1908).—Elwes & Henry, *Trees Gt. Brit. Irel.* IV. 900, t. 262, fig. 7 (1909).—Schneider, *Ill. Handb. Laubholz.* II. 822, fig. 516 a-b, 518 p (1912).—Wootton & Standley in *Contrib. U. S. Nat. Herb.* XIX. 496 (Fl. N. Mex.) (1915).

*Fraxinus anomala*, var. *triphylla* Jones in *Proc. Calif. Acad. Sci.* ser. 2, V. 707 (*Contrib. W. Bot.* VII) (1895).

NEW MEXICO. San Juan Co.: Carriso Mts., July 28, 1911, P. C. Standley (No. 7316).

ARIZONA. Coconino Co.: Grand Canyon, June 14, 1891, D. T. McDougal (No. 205), September 8, 1894, C. S. Sargent, September 12, 1894, J. W. Toumey, 1909, E. W. Nelson (No. 107), May 31, 1913, E. A. Goldman (No. 2068), June 30, 1913, A. E. Hitchcock (No. 79), July 19, 1914, A. Rehder (No. 105); two miles below Pagumpa, alt. 1300 m., April 21, 1894, M. E. Jones (No. 5088); Hermit Trail, June 18, 1916, Alice Eastwood (No. 5831).

SOUTHERN UTAH. Labyrinth, Colorado River, 1859, J. S. Newberry; St. George, Virgin River, E. Palmer; Ranch, A. L. Siler; Johnson, M. E. Jones.

This very distinct species occurs within our area only in northern Arizona and in the extreme northwestern corner of New Mexico and extends into Utah and Nevada. It shows little variation; the variety *triphylla* Jones can hardly be considered a distinct form or variety, as trifoliate leaves are likely to appear on any vigorous shoot of normal simple-leaved plants.

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<sup>4</sup>Except the sterile branch with pinnate leaves which was drawn from a cultivated plant supposed to be *F. anomala*.



